

Retraction

Retracted: Physical Education Teaching in Colleges and Universities Assisted by Virtual Reality Technology Based on Artificial Intelligence

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their

agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] Y. Wang, "Physical Education Teaching in Colleges and Universities Assisted by Virtual Reality Technology Based on Artificial Intelligence," *Mathematical Problems in Engineering*, vol. 2021, Article ID 5582716, 11 pages, 2021.

Research Article

Physical Education Teaching in Colleges and Universities Assisted by Virtual Reality Technology Based on Artificial Intelligence

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Virtual reality technology has promoted the reform of education. This research mainly discusses college physical education teaching assisted by artificial intelligence-based virtual reality technology. According to the position change of the virtual human's center of gravity, the spline keyframe interpolation method is used for interpolation, and the model pose obtained in each frame is rendered to obtain the virtual human's animation. After synthesizing a virtual human animation with three-dimensional human motion data, the animation can have functions such as video storage, fast playback, slow playback, and freeze. At the same time, the system can also display and play the virtual human animation and the video shot by the camera on the same screen, in order to make an intuitive comparison of the athletes' movements. Coaches can edit by hand or shoot the sports of outstanding domestic and foreign athletes on the spot and then use VC++6.0 as a development tool to analyze and get the simulation video of the 3D virtual human body. The virtual human animation technology in the motion analysis system is to relocate the three-dimensional motion data extracted from the video captured by the camera to the three-dimensional virtual human model we have established, and the three-dimensional virtual human will then simulate the technical actions of the athletes, which indirectly reflects that the three-dimensional movement information of the athletes enables coaches and athletes to observe the athletes' technical movements in a three-dimensional space in real time, repeatedly, and from multiple angles so that the coach can accurately guide the athletes' technical movements. Finally, a neural network based on artificial intelligence technology is used to evaluate the teaching effect. In the comparative experiment, 35% of the people in the virtual teaching experiment group were excellent, while the control group had only 10% in this excellent range (90–100). This research contributes to the smooth progress of VR technology teaching in colleges and universities.

1. Introduction

Virtual reality (VR), like smartphones and the Internet, will be a very disruptive technology. Like smartphones, VR uses new interface formats (head-mounted displays and hand-held controllers) to provide more intuitive and natural access to computing devices. Very similar to the Internet, it allows a new type of global communication, but this time it has a natural human experience. It is almost indistinguishable whether it is standing face to face or standing together.

In the next few years, most Internet users worldwide will use VR every day. Virtual reality (VR) is expected to become

one of the killer applications in 5G networks. However, many technical bottlenecks and challenges need to be overcome to promote its widespread adoption. In particular, the demand for VR in terms of high throughput, low latency, and reliable communication requires innovative solutions and basic research across multiple disciplines.

The success of immersive VR experiences depends on solving numerous challenges across multiple disciplines. Bastug E emphasized the importance of VR technology as a disruptive use case for 5G (and beyond). In addition, he studied three VR case studies and provided numerical results under various storage, computing, and network configurations. Although he revealed the limitations of the current

network and provided reasons for more theories and for the public to take the lead in VR innovation, research is still lacking in practice [1]. Patney believes that recessed rendering can synthesize images so that the details of the image outside the eye movement area are gradually reduced, which may significantly increase the display speed of wide-field displays. In order to study and improve the potential benefits, he designed an eccentric rendering user study to evaluate the perception of human peripheral vision when viewing today's displays. After verifying these insights on desktops and head-mounted displays, with the help of high-speed gaze tracking, he designed a perceptible target image to design and produce a centralized renderer. Although he designed a practical recessed rendering system, he did not verify its performance [2]. Sharar believes that immersive virtual reality (VR) dispersion therapy can effectively relieve pain clinically. 74 healthy volunteers (average age, 29 years; 37 women) received a standard 18-minute multimodal pain sequence (alternating thermal stimulation and distal stimulation) while undergoing immersive interactive VR distraction. The subjects used a 0–10 graphical rating scale to score their subjective pain intensity and entertainment and a 9-point scale to score their emotional and arousal state. Although the immersive VR distraction in his study significantly reduced the subjective pain intensity, its negative effects are unknown [3]. Freeman believes that, with virtual reality (VR) and computer-generated interactive environments, individuals can experience the problems they encounter repeatedly and learn how to overcome difficulties through evidence-based psychotherapy. He conducted a systematic review of empirical research. 285 studies were identified, 86 of which involved evaluation, 45 theoretical developments, and 154 treatments. His research found that treatment based on VR exposure can reduce anxiety, but there is a lack of promising research and treatment approaches [4].

According to the position change of the virtual human's center of gravity, the spline keyframe interpolation method is used for interpolation, and the model pose obtained in each frame is rendered to obtain the virtual human's animation. After synthesizing a virtual human animation with three-dimensional human motion data, the animation can have functions such as video storage, fast playback, slow playback, and freeze. At the same time, the system can also display and play the virtual human animation and the video shot by the camera on the same screen, in order to make an intuitive comparison of the athletes' movements. Coaches can edit by hand or shoot the sports of outstanding domestic and foreign athletes on the spot and then use VC++6.0 as a development tool to analyze and get the simulation video of the 3D virtual human body. The virtual human animation technology in the motion analysis system is to relocate the three-dimensional motion data extracted from the video captured by the camera to the three-dimensional virtual human model we have established, and the three-dimensional virtual human will then simulate the technical actions of the athletes, which indirectly reflects that the three-dimensional movement information of the athletes enables coaches and athletes to observe the athletes' technical

movements in a three-dimensional space in real time, repeatedly, and from multiple angles so that the coach can accurately guide the athletes' technical movements.

2. College Physical Education Teaching

2.1. Artificial Intelligence. The subjective application form of artificial intelligence technology in education and teaching (education robot, intelligent tutor system) has overturned the traditional subject and object of teaching [5, 6]. But this change does not mean that teachers are not needed [7]. It is just that the tasks that teachers undertake in teaching activities have changed, from the traditional "preaching, teaching, and solving puzzles" to "designing, advancing, assisting, and caring" [8, 9]. The specific performance is to design learning activities, promote the learning process, help solve students' psychological problems, and care about the overall development of all students [10]. This is something that technology cannot replace [11, 12].

At present, in the field of higher education in my country, artificial intelligence has classic research in the field of artificial intelligence such as machine learning and deep learning, as well as the application of artificial intelligence in traditional disciplines such as biomedicine and general information theory [13]. As an indispensable part of my country's scientific research force, universities lead the direction and trend of my country's scientific research [14, 15]. Under the current background of artificial intelligence, it is necessary to invest more material and human resources in artificial intelligence research and actively cultivate students' scientific research concepts and scientific research capabilities based on the current era [16]. Only after defining the similarity between the motion frames can a "difficult action" be automatically located from the "original motion segment" [17, 18]:

$$D(t_1, t_2) = \|m(t_1) - m(t_2)\| = \sum_{i=1}^n \alpha_i d(q_i(t_1), q_i(t_2)), \quad (1)$$

with $i = 1, 2, \dots, n$.

Linear interpolation is used to calculate the mixed motion of the overlapping part [19].

$$P_p = \alpha(p)P_A + [1 - \alpha(p)]P_B, \quad (2)$$

where P stands for frame.

The result is the translational position P_p of the human root node in the p -th frame in motion:

$$q = \text{slerp}(q_A, q_B, \alpha(p)). \quad (3)$$

It can be seen that the quaternion can represent the degree of rotation of the human joint i in the p -th frame in the synthetic motion [20, 21].

2.2. Virtual Reality Technology. The three-dimensional character generation process is as follows. First, find the relative coordinates of each joint point relative to the center of gravity of the virtual human body, and eliminate the influence of the translational movement on the joint motion

of the virtual human body [22]. Then apply the knowledge of inverse dynamics to obtain the rotation angle of each joint relative to its “parent” node [23, 24]. According to the position change of the center of gravity of the virtual human at different times, the spline keyframe interpolation method is used to interpolate the spatial position of the virtual human. For the initial position of each joint on any two motion keyframes and the rotation angle of the joint obtained by inverse dynamics, we use the quaternion interpolation method to interpolate to form an intermediate picture. The model pose obtained in each frame is rendered and played continuously at the frame rate of the real situation, and the animation of the virtual human model movement is obtained [25]. On this basis, the program itself can save the formed virtual human animation as an AVI file, which provides the necessary preparation for the later video synthesis operation [26].

The connection between the two motion segments is basically similar:

$$\begin{aligned} q &= \text{slerp}(q_A, q_B, \alpha(p)), \\ c_j &= ((f_{i1}, t_{i1}), (f_{i2}, t_{i2}), \dots, (f_{ij}, t_{ij})). \end{aligned} \quad (4)$$

Each t_i moment corresponds to a posture f , and its splicing action sequence is

$$c_j = ((f_{i1}, t_{i1}), \dots, (f_{i2}, t_{i2}), \dots, (f_{im}, t_{im}), \dots, (f_{jn}, t_{m+n})). \quad (5)$$

The stitching algorithm should ensure the continuity of time, the continuity of the coordinates of the center of gravity of the human body, and the continuity of the human body posture. Then the transformation of f_{im} and f_{jt} has the following relationship:

$$\begin{aligned} f_{jt} &= M * f_{im}, \\ M &= f_{jt} * f_{im}^{-1}. \end{aligned} \quad (6)$$

Through the analysis of the path curve, we can get whether two athletes will collide.

$$d = T_{P_1 L_1} - T_{P_1 L_2} - T_{L_1 L_2}. \quad (7)$$

The basic process of VR teaching is as follows:

- (1) Construct the corresponding virtual human body model and 3D scene according to user needs. The system itself comes with a virtual character model library. The technician or user administrator can choose different types of human body models according to user requirements. The actual training scene is to build a virtual scene for it, including sports reference objects [27].
- (2) Real-time capture of exercise data. Generally speaking, this function is realized by two cameras and a computer. The cameras obtain video files of human motion during the process of simultaneous shooting and use existing computer technology to extract keyframe images from the video files, and then it is done manually. The method of intelligence,

pattern matching, and computer graphics extracts the moving human body, obtains the final two-dimensional information of each joint point and the outline of the moving object, and finally calculates the three-dimensional motion data of the human body according to the two simultaneous engravings of the two-dimensional information of the human body and generates the computer animation.

- (3) Reproduce the action. This function is to relocate the three-dimensional human body motion data we get to the virtual human (animation), play the virtual human at a certain frame rate, and then form an animation after rendering in the three-dimensional scene. The students' movements are recorded by the computer. High-quality simulation is reproduced, and students can watch their actions from multiple angles and all directions in order to improve Among them, “action reproduction” is the core requirement of the simulation system. The trainer can also simulate some technical actions that are still under research and can also observe the technical actions of the students from multiple angles in this way, so as to give the students a visual and intuitive guide.
- (4) Obtain motion parameters. According to the different requirements of coaches and trainees, the system can feed back various parameters related to athletes and sports, such as heart rate, blood pressure, etc. This can not only objectively control sports risks but also promote the objective control of sports risks. The trainees' indicators are quantified.
- (5) Real-time image display training effect. All the data that can represent the athlete's performance are presented in real time and vividly in the form of charts, which greatly facilitates the teaching of coaches to compare the athlete's performance horizontally and vertically and to understand his/her training process and training in time, whether there are positive changes in the results after the end.
- (6) Refined data. Due to the widespread existence of errors and uncontrollable factors, we can only get rough data, which puts forward requirements for the system to refine the rough data, such as smoothing and deleting the data. After finishing the refinement, we can improve the technical actions and create new actions, such as connecting several technical actions in series.
- (7) Synchronous comparison of composite video. The application of virtual reality technology to sports training can significantly improve the training level and competitive level of athletes while reducing costs and not reducing the amount of training. It also greatly promotes the development of sports as a national fitness exercise. Modern sports training research and application play an increasingly important role. The diagnostic process of sports technology in physical education is shown in Figure 1.

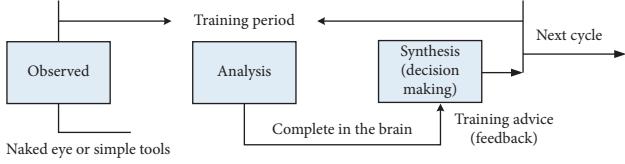


FIGURE 1: Diagnostic process of sports technology in physical education.

2.3. Extraction of Public Frames. The existence of the common frame is the basis of the algorithm in this paper. The two action segments before and after the action arrangement must have similar postures to ensure a smooth transition. For any two posture data, the center of gravity distance $D_R(f_i, f_j)$ of the two postures can be expressed as

$$D_R(f_i, f_j) = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2 + (z_i - z_j)^2}. \quad (8)$$

The degree of freedom of the human body's posture direction is

$$D_d(f_i, f_j) = \sum_{k=1}^S \|J_i - J_j\|^2. \quad (9)$$

J represents a measure of the degree of freedom of the human body, given two sets of points:

$$\begin{aligned} A &= \{(A_1, w(A_1)), (A_2, w(A_2)), \dots, (A_m, w(A_m))\}, \\ B &= \{(B_1, w(B_1)), (B_2, w(B_2)), \dots, (B_m, w(B_m))\}. \end{aligned} \quad (10)$$

The transport distance between A and B is also called Monge – Kantorovich distance.

$$D_{\text{Monge-Kantorovich}} = \frac{\min_F \sum_{i=1}^m \sum_{j=1}^n f_{ij} d_{ij}}{\sum_{i=1}^m \sum_{j=1}^n f_{ij}}. \quad (11)$$

In actual engineering, keyframes often need to add a certain person's prior knowledge, for example, the high point, low point, and inflection point of a certain action or the intersection point of two or more actions. The action of this point must be selected as a keyframe; at this time, it is regarded as the starting frame or the node frame, and then another frame is to be found manually. There are also some very special situations. For example, the video playback speed is too fast (e.g., football in a football match), the difference between the two frames is too large, or the appropriate first and last frames cannot be found according to the above method. At this time, the above method is completely invalid. You should look for the video shot by the high-speed camera. In this kind of video, the time interval between two consecutive frames is much smaller than that of the ordinary video. You can often find the first and last frames you need. Another situation is that the time interval between the first and last frames found is too large. At this time, the last frame should be discarded and a new last frame should be searched for. Experience tells us that this method is feasible.

3. College Physical Education Teaching Experiment

3.1. Human Body 3D Animation Generation

- (1) Use the relative coordinates of the human body's center of gravity to eliminate the influence of drift on joint motion.
- (2) Calculate the rotation angle of the joint relative to its "parent" node.
- (3) According to the position change of the virtual human's center of gravity, the spline keyframe interpolation method is used for interpolation.
- (4) Using the initial position and rotation angle of the joints on the two keyframes, the middle image is calculated by quaternion interpolation.
- (5) Render the pose of the model obtained in each frame to obtain the animation of the virtual human.

3.2. Editing of Motion Sequence. In actual operation, we often combine the modification of the motion curve of a certain joint with the inverse dynamics organically to achieve the purpose of adjusting the posture of the virtual human. First, we apply the above method to modify the motion curve of a joint of the virtual human, and then according to the position of the joint point at each moment on the modified curve, we use the knowledge of inverse dynamics to reversely find the other joint points corresponding to this. The system marks the position at this time and then redirects the modified result to the virtual character to achieve the virtual effect.

- (1) Target action requirements, including basic information such as the type and length of the target action.
- (2) Arrangement of the motion and use of the motion fragments captured by the motion to synthesize new motion fragments as required.
- (3) Smooth transition, dissatisfaction with the final synthesized animation, and modification of mechanical requirements or collision.

3.3. Realizing the Same-Screen Comparison of Sports Simulation Results and Athletes' Actions. After synthesizing virtual human animation with 3D human motion data, the animation should have most of the functions of ordinary video, such as video storage, fast playback, slow playback, and freeze frame. At the same time, the system should be able to display and play the virtual human animation and the video captured by the camera on the same screen, in order to make an intuitive comparison of the athletes' movements.

The main research is the combination of virtual and real technology. Coaches can edit by hand or shoot the sports of outstanding athletes at home and abroad and then use VC++6.0 as a development tool to analyze and get the simulation video of the three-dimensional virtual human body. The virtual human animation technology in the

motion analysis system is to relocate the three-dimensional motion data extracted from the video captured by the camera to the three-dimensional virtual human model we have established, and the three-dimensional virtual human will then simulate the technical actions of the athletes, which indirectly reflects that three-dimensional sports information of the athletes enables coaches and athletes to observe the technical movements of the athletes in three-dimensional space in real time, repeatedly, and from multiple angles so that the coach can accurately observe the technical movements of the athletes after repeatedly observing the virtual human animation guide.

3.4. Virtual Teaching Videos Based on Virtual Reality Technology

3.4.1. Preliminary Shooting and Production. Conceive and design the content and shooting content of the virtual teaching video of sports dance, such as the teaching plan, teaching important and difficult points, scene setting, and shooting angle. According to the teaching plan, determine the technical actions of each lesson, highlight its details and important and difficult points, then select at the right time and place, take a video or panoramic shot in the real-view location, and then output the panoramic video or panoramic image on the computer or mobile phone.

3.4.2. Mid-Term Synthetic Production. For the teaching materials obtained in the early stage, use professional computer software to perform video editing or panorama stitching according to the teaching plan, and postprocessing to output the panorama video or panorama.

3.4.3. Post Network Release. Synthesize the panoramic video produced in the mid-term, conduct logic testing for bugs and continuously improve the content, repeat, and finally, output video samples. Display VR video content through a VR player (such as insta 360 player, storm VR), watch the content repeatedly, and test it. The team has to modify it according to the shortcomings, and finally complete the release.

3.5. Physical Education Evaluation Module Based on Artificial Intelligence Technology. Mainly use neural network to score teaching effect. The evaluation result analysis module is used to guide the evaluator to correctly analyze the evaluation results, to store the evaluation results and analysis results, and to provide corresponding sample models and simulation models for system self-learning. The knowledge base management system is responsible for acquiring valuable knowledge and for the maintenance and management of various knowledge required during system operation. The model method management system is responsible for the operation, maintenance and management of the models and methods in the system, and realizing the calling and linking of models and methods under the guidance of knowledge. Accordingly, with the neural network evaluation model

scheduling, various models (such as neural network-based system self-learning models) are stored in the model library. The basic process of teaching evaluation module is shown in Figure 2.

4. College Physical Education Teaching

4.1. Test Results of the Body Shape before the Experiment. The body shape before the experiment is shown in Table 1. The main research content of this paper is to test the new physical education teaching method using virtual reality technology whether there is a clear difference in the teaching effect from the traditional teaching mode. In order to eliminate the influence of other factors on the experiment, the experiment must first be checked. The students in the group and the control group tested the 5 basic functions of the body before the experiment. Since the experimental samples are all 15–17-year-old students and the students are in the growth and development period, it is necessary to carry out statistical tests and analysis. The experiment was divided into two groups, each with 20 people, 10 male students and 10 female students. The data comparison in Table 1 shows that there is no significant difference in the physical state of the two groups of students before the tennis class ($P > 0.05$), which can be used as a sample for this experiment.

In order to make the experimental results more accurate and convincing, a simple physical test was performed on the students who participated in the experiment, and a T test was performed on the measurement data. The results of the T value test are shown in Table 2. People's daily production and life, as well as the process of physical exercise, are all carried out under the regulation and control of the central nervous system. The reflection of the various organs of the body is called physical fitness. Physical fitness can also represent the various functions of the human body's muscles during exercise. Obvious differences in physical fitness may affect the accuracy of the experiment. From Table 2, we can see that there is no significant difference between the two groups of tests ($P > 0.05$).

The statistical results of students' interest before the experiment are shown in Table 3. In order to minimize the influence of external factors on the experiment, a questionnaire survey was conducted on the sample's interest in tennis learning before the lecture. It can be seen from Figure 3 that most of the students choose tennis lessons because they are interested in tennis. Among them, 26 people like tennis very much, accounting for 82.5% of the total number of subjects. As the saying goes, interest is the best teacher. The students who participated in the experiment showed a high interest in tennis learning, which can also make the students more enthusiastic about tennis learning. Figure 3 shows the comparison of interest in tennis between the experimental group and the control group before the experiment.

The results of the questionnaire are shown in Figure 4. According to the statistics of the questionnaire survey of the two groups of students, it can be seen that the most important way for the two groups of students to obtain tennis

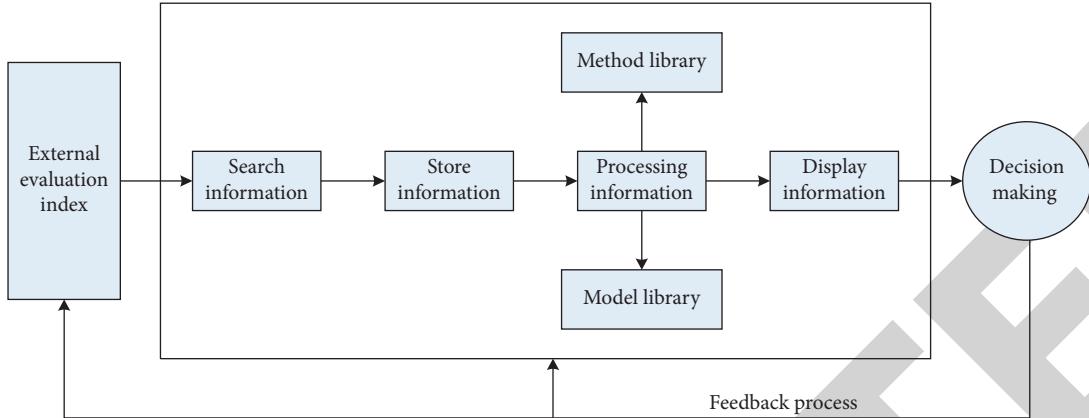


FIGURE 2: Basic process of teaching evaluation module.

TABLE 1: Body shape before the experiment.

Group	Test group		Control group		<i>T</i>	<i>P</i>
	Gender	X	S	X	S	
Height (male)	174.25	5.28	173.82	4.61	0.274	>0.05
Weight (male)	66.36	4.02	65.85	3.96	0.404	>0.05
Height (female)	165.34	4.88	164.27	4.63	0.711	>0.05
Weight (female)	50.05	3.74	48.92	3.38	1.002	>0.05

knowledge is through colleague TV communication, accounting for 35%, and 14 students obtained tennis knowledge through television, followed by the Internet, accounting for 17%, advertising and propaganda accounting for 20%, and books and magazines, accounting for 15%. Tennis knowledge obtained from classmates and teachers is the least. In the process of investigating and discussing with classmates, it was found that many students had the idea of learning tennis because they had watched the cartoon *Prince of Tennis* before. Therefore, the widespread of this cartoon is because students love tennis and want to obtain tennis knowledge, so many students did not hesitate to choose tennis when choosing physical education. In addition, in the process of growing up, he watched many wonderful tennis matches, and he became more determined to choose tennis as a sport. Through their own efforts to learn tennis-related knowledge and practice tennis-related skills, students will eventually become master tennis players like the characters in the *Prince of Tennis* and shine on the tennis court.

4.2. Test Results of the Body Shape and Physical Fitness of the Two Groups of Students after the Experiment. The body shape tests of the two groups of students after the experiment are shown in Table 4. The physical fitness tests of the two groups of students after the experiment are shown in Table 5. After the lecture, the last stage of the experiment is to perform physical tests on the students again. In order to ensure the accuracy of the experiment, the test indicators before and after the experiment are the same, and the corresponding methods of measuring various body values are also the same. After joining the class, we found that the students' height

and weight will not change much. However, some values of physical fitness have changed, which is different from the previous test results. Through statistical analysis, the two projects of standing long jump and 50 m running show that the students who use the new virtual reality teaching mode to learn show better results than the students under the traditional model. The difference is not significant. Figure 5 shows the results of student body shape analysis. Figure 6 shows the analysis result of students' physical fitness.

4.3. Comprehensive Scores of Tennis Skills between the Two Groups of Students after the Experiment. Table 6 shows the comparison of the comprehensive scores of tennis skills between the two groups of students. Figure 7 shows the analysis of the comprehensive performance of the tennis skills of the two groups of students. According to Table 7, it can be concluded that there is a significant difference between the two. The overall performance of the students in the virtual teaching experimental group is in the average and good range, and the number of outstanding students is small, which shows that this teaching method is more suitable for high school sports than the traditional teaching mode. The development of tennis teaching needs also shows that the virtual teaching method has been loved and praised by the majority of teachers and students. It not only allows students to learn the skills of tennis in a short period of time, but also completes the requirements of the credit system and maximizes the transfer. Students' interest in tennis along with a high-quality learning environment can keep students' enthusiasm for learning. Virtual teaching technology makes it easier for students to master tennis skills, with simple and convenient operation, making it easier for students to enjoy it. According to Figure 7, 35% of the people in the virtual teaching experiment group were excellent, while the control group had only 10% in this excellent range (90–100), and only the virtual teaching number reached one-third of the excellent people. In the good range (80–89), the number of students in the two parties is basically the same. The virtual teaching is 40%, and the control group occupies 35%. In the range of general scores (70–79), the number of students in the control group reaches 40%. The teaching experiment

TABLE 2: *T* value test results.

Group Gender	Test group		Control group		<i>T</i>	<i>P</i>
	X	S	X	S		
Standing long jump (male)	222.4	13.12	223.53	13.49	-0.269	>0.05
50 m (s) (male)	7.34	0.46	725	0.42	0.646	>0.05
Swollen capacity (male)	3730.3	620.8	3759	6154	-0.147	>0.05
Standing long jump (female)	166.25	6.01	164.83	6.29	0.730	>0.05
50 m (s) (female)	8.82	0.76	865	0.70	0.736	>0.05
Swollen capacity (female)	238.5	502.6	2365.4	5183	-0.043	>0.05

TABLE 3: Statistics of student interest before the experiment.

Group Interest	Test group		Control group		<i>T</i>	<i>P</i>
	X	S	X	S		
Pre-experiment interest	4.05	0.51	3.95	0.69	0.521	>0.05

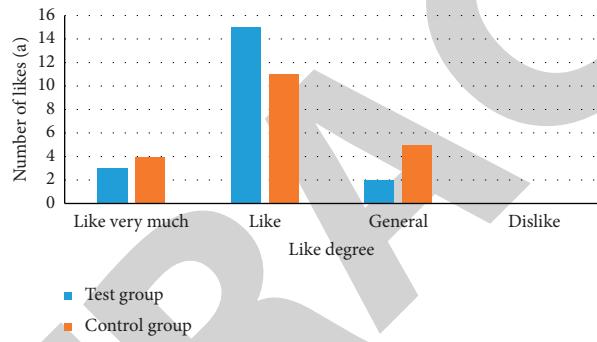


FIGURE 3: Comparison of interest in tennis between the experimental group and the control group before the experiment.

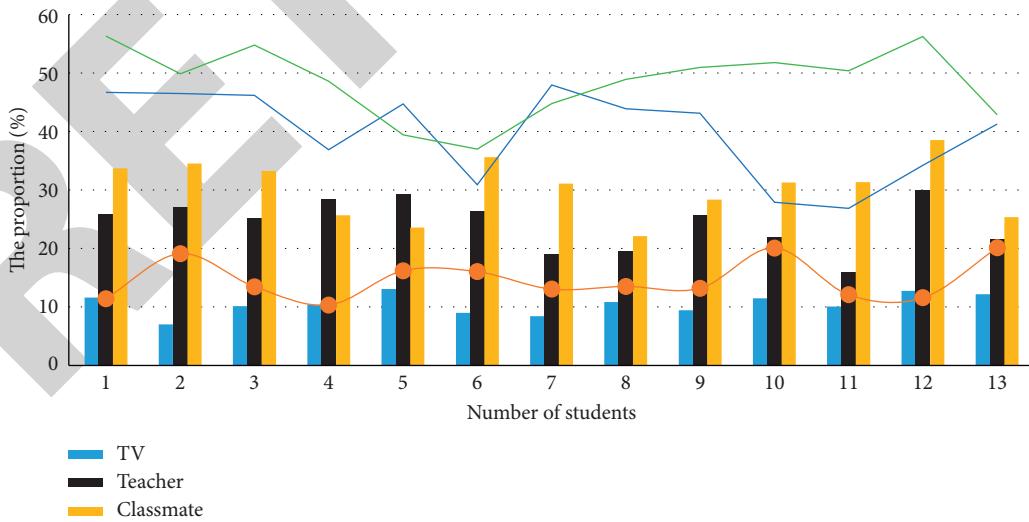


FIGURE 4: Results of the questionnaire.

group has only 20%. From this point of view, under normal circumstances, most people in the control group will get intermediate grades. 5% of the virtual teaching group and 10% of the control group were in the pass range.

4.4. Comparative Analysis of Learning Effects. After the experiment, the comparison of the forehand and backhand technique evaluation scores of the two groups of students is shown in Table 7. Figure 8 shows the comparison results of

TABLE 4: Body shape tests of the two groups of students after the experiment.

Group Gender	Test group		Control group		<i>T</i>	<i>P</i>
	X	S	X	S		
Height (male)	174.25	5.28	173.82	4.61	0.274	>0.05
Weight (male)	6632	4.05	65.80	3.91	0.413	>0.05
Height (female)	165.34	4.88	164.27	4.63	0.711	>0.05
Weight (female)	50.01	3.72	48.96	3.33	0.941	>0.05

TABLE 5: Physical fitness tests of the two groups of students after the experiment.

Group Gender	Test group		Control group		<i>T</i>	<i>P</i>
	X	S	X	S		
Standing long jump (male)	236.4	14.52	231.71	13.92	1.043	>0.05
50 m (s) (male)	7.11	0.26	7.17	0.24	-0.758	>0.05
Swollen capacity (male)	3894.5	212.1	3810.2	204.6	1.279	>0.05
Standing long jump (female)	169.92	6.74	167.13	6.33	1.349	>0.05
50 m (s) (female)	8.31	0.56	8.42	0.62	-0.589	>0.05
Swollen capacity (female)	2595.2	302.7	2478.4	3189	1.188	>0.05

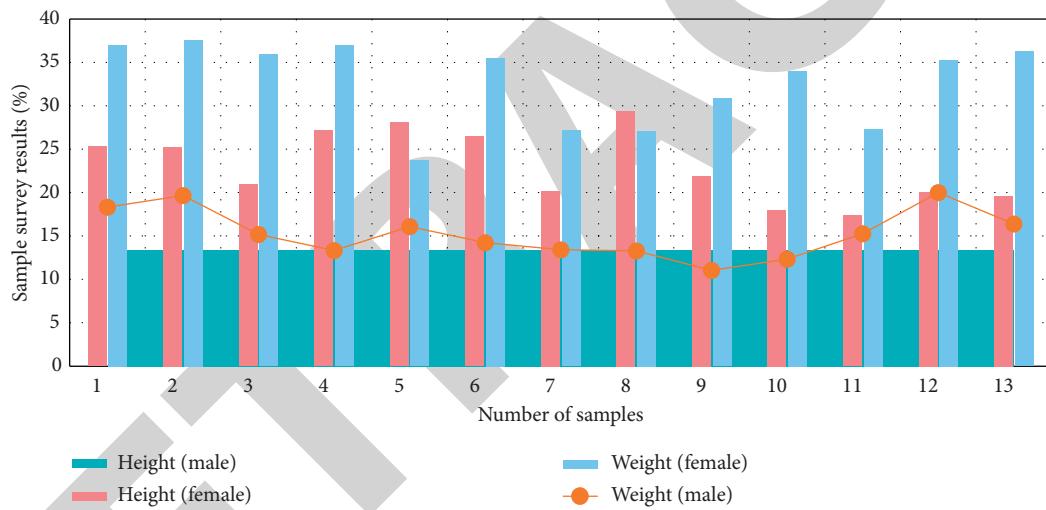


FIGURE 5: Results of student body shape analysis.

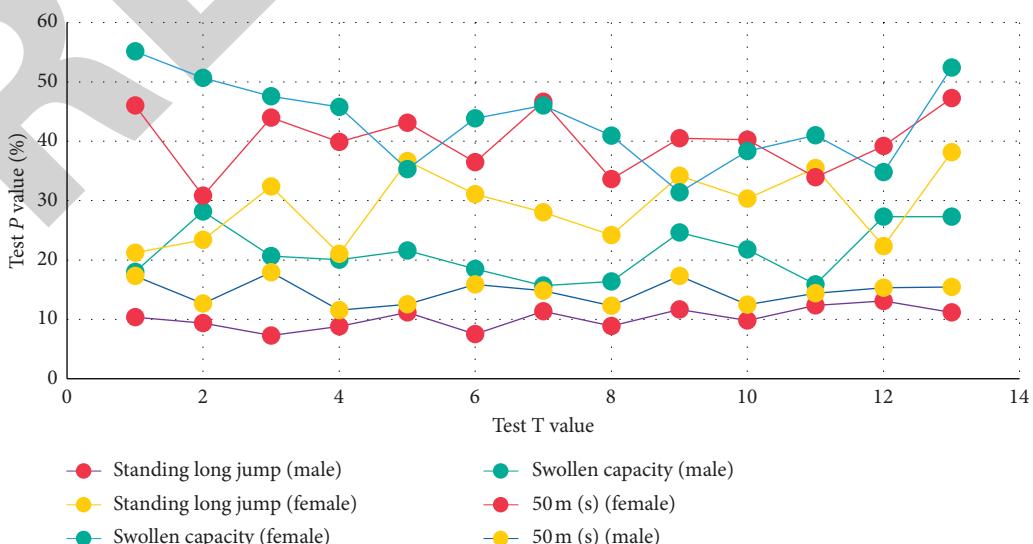


FIGURE 6: Results of analysis of students' physical fitness.

TABLE 6: Comparison of comprehensive scores of tennis skills between two groups of students.

Group Score	Test group		Control group		<i>T</i>	<i>P</i>
	X	S	X	S		
Comprehensive skill score	171.57	8.70	158.21	6.25	3.908	>0.05

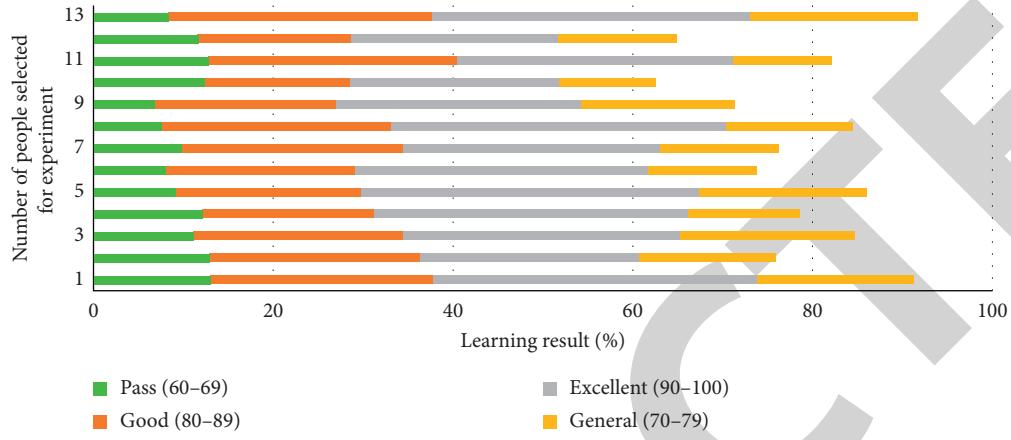


FIGURE 7: Analysis of the comprehensive scores of tennis skills between two groups of students.

TABLE 7: Comparison of forehand and backhand technique evaluation scores of the two groups of students after the experiment.

Score	Test group		Control group		<i>T</i>	<i>P</i>
	X	S	X	S		
Forehand technique	82.67	11.16	75.11	10.09	2.247	<0.05
Backhand technique	78.16	10.23	71.35	10.72	2.055	<0.05

the forehand and backhand skill scores of the two groups of students. According to the data comparison in Table 7, it can be judged that the scores of the experimental group students and the traditional teaching mode students in tennis forehand technique are 82.67 points and 75.11 points, respectively, and the average score of the two groups is 7.56 points. The test group scored 78.16 points, and the control group scored 71.35 points. The difference between the two was 6.81 points. According to the experimental results, it can be judged that there is a significant difference between the virtual teaching method and the traditional teaching method ($P < 0.05$). The students in the experimental group have a higher level of tennis skills than the subjects in the control group. The reason may be that, in the virtual reality teaching group, students have a full understanding of the details of various tennis techniques through auxiliary equipment, and they continue to consolidate and strengthen during the learning process. With the improvement of proficiency, the students in the experimental group have better mastery of tennis skills, so they are more interested and enthusiastic about tennis learning and practice. On the other hand, in the traditional teaching group, students will encounter various situations that are not conducive to learning due to the insufficient grasp of the details of tennis technology, which will lead to a decrease in learning interest and low enthusiasm.

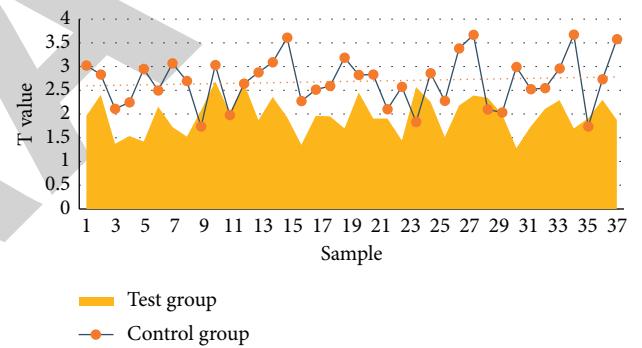


FIGURE 8: Comparison of forehand and backhand scores of the two groups of students.

5. Conclusion

In actual operation, we often combine the modification of the motion curve of a certain joint with the inverse dynamics organically to achieve the purpose of adjusting the posture of the virtual human. First, we apply the above method to modify the motion curve of a joint of the virtual human, and then according to the position of the joint point at each moment on the modified curve, we use the knowledge of inverse dynamics to reversely find the other joint points corresponding to this. The system recognizes the position at this time and then redirects the modified result to the virtual character, thus achieving the virtual effect. The system requires basic information for the target action, such as the type and length of the target action. Arrange the movement, and use the captured movement fragments to synthesize new movement fragments as required.

The main research is the combination of virtual and real technology. Coaches can edit by hand or shoot the sports of outstanding athletes at home and abroad and then use

VC++6.0 as a development tool to analyze and get the simulation video of the three-dimensional virtual human body. The virtual human animation technology in the motion analysis system is to relocate the three-dimensional motion data extracted from the video captured by the camera to the three-dimensional virtual human model we have established, and the three-dimensional virtual human will then simulate the technical actions of the athletes, which indirectly reflects that three-dimensional sports information of the athletes enables coaches and athletes to observe the technical movements of the athletes in three-dimensional space in real time, repeatedly, and from multiple angles so that the coach can accurately observe the technical movements of the athletes after repeatedly observing the virtual human animation guide.

Conceive and design the content and shooting content of the virtual teaching video of sports dance during the preliminary shooting and production process, such as the teaching plan, teaching difficulties, scene setting, and shooting angle. According to the teaching plan, determine the technical actions of each lesson, highlighting its details, focus on difficult points, then select the appropriate time and place, take the video or panoramic shooting in the real scene, and then output the panoramic video or panoramic image on the computer or mobile phone. This research contributes to the smooth progress of VR technology teaching in colleges and universities.

Data Availability

No data were used to support this study.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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